Claims

[c1] 1. A nucleic acid sequencing method, comprising:
providing a thin film having a pore;
disposing at least a nucleic acid sequence on the thin film, wherein the nucleic acid sequence comprises a plurality of nucleotides;
applying an electric field perpendicular to the thin film, so that the nucleic acid sequence passes through the pore, wherein an adjustable rotating electric field parallel to the thin film is applied simultaneously, in order to control a translocation time of one nucleotide being a multiple of one-fourth of a period of the rotating electric field; and
measuring the translocation time of each nucleotide to determine a sequence of the nucleic acid sequence.

[c2] 2. The method of claim 1, wherein the pore has a size of about 2 to 3 nm.

[c3] 3. The method of claim 1, wherein the thin film comprises a silicon nitride thin film.

[c4] 4. The method of claim 1, wherein the pore of the thin film is formed by an ion beam.

[c5] 5. The method of claim 1, wherein the rotating electric field is formed by one set of parallel electrode pairs perpendicular to another set of parallel electrode pairs, while one set of parallel electrode pairs generate a sinusoid (sine) AC electric field and the other set of parallel electrode pairs generate a cosinusoid (cosine) AC electric field.

[c6] 6. The method of claim 1, wherein the period of the rotating electric field is smaller than 10^4 Hz.

[c7] 7. The method of claim 1, further comprising measuring a blockage current of each nucleotide and analyzing change of the blockage current over time to determine the sequence of the nucleic acid sequence.

[c8] 8. The method of claim 1, further comprising adding two extra sequence fragments to both ends of the nucleic acid sequence for labeling the both ends.

[c9] 9. A nucleic acid sequencing method, comprising:
providing array cells formed in a thin film, wherein each array cell has a pore;
disposing at least a nucleic acid sequence in the array cell, wherein the nucleic acid sequence comprises a plurality of nucleotides;
applying an electric field perpendicular to the thin film, so that the nucleic acid sequence pass through the pore, wherein a adjustable rotating electric field parallel to the thin film is simultaneously applied for controlling translocation times of the nucleotides; and
measuring a blockage current of each nucleotide and analyzing change of the blockage current over time to determine a sequence of the nucleic acid sequence.

[c10] 10. The method of claim 9, wherein the pore has a size of about 2 to 3 nm.

[c11] 11. The method of claim 9, wherein the thin film comprises a silicon nitride thin film.

[c12] 12. The method of claim 9, wherein the pore of the thin film is formed by an ion beam.

[c13] 13. The method of claim 9, wherein the rotating electric field is formed by one set of parallel electrode pairs perpendicular to another set of parallel electrode pairs, while one set of parallel electrode pairs generate a sinusoid (sine) AC electric field and the other set of parallel electrode pairs generate a cosinusoid (cosine) AC electric field.

[c14] 14. The method of claim 9, wherein the period of the rotating electric field is smaller than 10^{4} Hz.

[c15] 15. The method of claim 15, further comprising adding two extra sequence fragments to both ends of the nucleic acid sequence for labeling both ends.